Outdoor Laboratory as an Aid to Teaching Biology in the Secondary Schools

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The usual approach to teaching biology in the secondary schools today almost totally ignores the study of plants and animals in the field. This is in spite of the fact that the field is a focal point of biology where living organisms occur naturally and the most logical place to gain insights on relationships between living organisms and their environments. It can be further stated that since most youngsters enjoy field work, an excellent learning situation is present. Also, most schools, particularly in Arkansas, can readily obtain access to areas suitable as outdoor laboratories for field work, no expensive equipment is required, and the field is an easy place to gather information suitable for teaching the scientific method as applied to the principles of biology through the study of plant and animal populations and their environments.

There are several reasons why field work has been so badly neglected as a teaching aid in biology, but the primary reason has been the lack of training on the part of most biology teachers in effective use of the outdoor laboratory as a teaching device.

In 1965, the University of Arkansas was awarded a grant by the National Science Foundation to conduct a Cooperative College-School Project in Biology for high school teachers and students for a ten week period during the summer of 1966.

The primary objectives of this project pertinent to the use of the outdoor laboratory were: (a) to strengthened the training of secondary school teachers in basic fundamentals of ecology; (b) to show them how to effectively use the laboratory in their teaching; and, (c) to help them implement field work into the biology training programs of their own schools. Related objectives were to help the teachers gain an increased understanding of the methods of science by: (a) engaging them in actual short-term research projects in field ecology and directing the written report of their studies; (b) provide a situation where the teachers could direct student investigations under the guidance of experienced research scientists; and, (c) provide high-ability high school students a stimulating experience in field studies and give them an opportunity to learn how to communicate their findings in the manner of scientific papers.

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2Associate Professor of Botany and CCSS Project Director.
Thirty-one high school teachers representing thirty schools in Arkansas, Missouri, Oklahoma, and Kansas arrived on June 6, and were enrolled in field botany and zoology courses carrying graduate credit applicable toward the Master of Natural Science degree.

The course content was essentially the same as most beginning plant and animal ecology courses, but the approach was oriented toward general ecological principles and field procedures most useful to a high school teaching situation. Also, considerably more time than usual was spent on the techniques of gathering, compiling, and interpretation of data, and writing a short paper in a manner that was at least mechanically suitable for publication as a scientific paper in a professional journal. All papers were based on field data gathered by teachers working individually or in teams, and on pertinent literature from professional journals and other appropriate materials.

The course organization consisted of regularly scheduled lectures in plant and animal ecology presented by the project faculty, and field work in five different vegetation types. All field work was conducted in the Lake Wedington Division of the Ozark National Forest located approximately thirteen miles west of Fayetteville. In addition, university faculty members from four departments served as consultants. They presented information directly pertinent to basic ecology in entomology, geology, soil science, and plant pathology through special lectures, demonstrations, and field trips.

The first five weeks of the project were concerned with teacher training only. Field studies were usually scheduled in the mornings, and classroom work in the afternoons. This was done in the interest of comfort to escape the higher afternoon temperatures in the field, and to take advantage of air conditioned classrooms available in the afternoons.

High-ability eleventh grade students who had completed a course in high school biology entered the training program at the beginning of the second five weeks on July 10. In most instances, one student participant was selected from a list of one or more students nominated by each teacher from his own school. This selection procedure was followed primarily because the student would be available to help the teacher implement the outdoor laboratory program in his school the following fall.

The course content for students was similar to that given the teachers with modifications appropriate to their level of training.

Most lectures to students in basic plant and animal ecology were given by the project faculty, and special lectures, field trips, and laboratory work were presented by the consultants. The regular field and laboratory work was taught by the teacher participants, who also directed individual student research projects. This plan made it possible for the students to receive high-level instruction as a group from the university faculty, and individual supervision of field and laboratory
work by his teacher. The teachers gained experience in directing student field work with the project faculty available for consultation if needed.

Opinions expressed by teacher participants, project staff, and high school administrators shortly after the close of the training program on August 10 seemed to indicate that the project objectives were effectively accomplished. This was later confirmed by visits to each participating school by the director or other project faculty during the late summer of 1966 and during the academic year of 1966-1967, and on the basis of personal communications and questionnaires returned by the teachers during the spring of 1967.

One accomplishment of the project deemed particularly worthwhile was the establishment and use of outdoor laboratories in twenty-seven high schools, with consequent upgrading of teaching programs. Another is the development of a preliminary version of a laboratory block on field studies by some of the teacher participants as a result of their work in the project. This material is being tested in some schools at present, and appropriate revisions are being made in cooperation with the project faculty. Other worthwhile accomplishments include the competence in basic ecology, field techniques, and methods of scientific research and writing acquired by both teacher and student participants, and finally, the stimulation of interest in field studies on the part of many high school students. Several teachers have reported that in many instances the slower students in the biology classes of their schools have gained as much or more from the field work as the better students.

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